

What is claimed is:

1. A retractable barrel comprising:

a rear holder configured to hold a rear optical element on an axis, said rear holder comprising a recess;

5 an annular member movable along the axis towards and away from said rear holder without rotation;

a retractable holder, accommodated within the annular member, configured to hold a retractable optical element, the retractable holder being movable between an 10 aligned position where the retractable optical element is aligned with the axis, and a displaced position where the retractable optical element is displaced relative to the axis; and

15 a position controller configured to control said annular member and retractable holder to move between an operational position spaced from said rear holder with said retractable holder at said aligned position to a retracted position where said rear optical element is accommodated within the inner peripheral surface of the 20 annular member with said retractable holder at said displaced position and where a portion of said rear holder and a portion of said retractable holder are at the same position on said annular member axis;

25 wherein a movement path of said retractable holder includes an oblique path extending obliquely to the axis;

and

wherein said recess configured to prevent said rear holder from interfering with said retractable holder as said retractable holder moves to and from the operational 5 position and the retracted position.

2. The retractable barrel according to claim 1, wherein said recess has a surface inclined in a direction of movement of said retractable holder to and from the operational position or the retracted position.

10 3. The retractable barrel according to claim 1, wherein said retractable holder comprises a ring member, and wherein said recess has a radius orthogonal to said annular member axis which is the substantially the same or larger than the radius of said ring member.

15 4. The retractable barrel according to claim 1, wherein said retractable member comprises a swingable member which is rotatably supported on a pivot parallel to said support member axis to be swingable about said pivot.

20 5. The retractable barrel according to claim 1, wherein said rear holder is substantially a rectangular shape and includes a front end surface and four side surfaces which extend rearward from said front end surface to surround the axis; and

25 wherein said recess is on an area of said rear holder

which extends over said front end surface and at least one of said four side surfaces.

6. The retractable barrel according to claim 1, wherein said rear holder is movable along said 5 photographing axis.

7. The retractable barrel according to claim 6, further comprising:

at least one guide shaft located outside said annular member to extend substantially parallel to the 10 axis; and

wherein said rear holder includes at least one radial arm portion which projects radially outwards from said rear holder, said rear holder independently movable and guided by said at least one guide shaft in the axis 15 direction.

8. The retractable barrel according to claim 7, wherein said rear holder has a pair of radial arm portions which project radially outwards in substantially opposite directions away from each other; and

20 wherein the retractable barrel further comprises a pair of guide shafts configured to respectively guide said pair of radial arm portions.

9. The retractable barrel according to claim 6, further comprising:

25 a stopper located on a side of the rear holder remote

from said annular member, said stopper configured to set a movement limit of said rear holder; and

a controller configured to control movement of said rear holder to said movement limit before commencement 5 of movement of said annular member and retractable holder from said operational position to said retracted position.

10. The retracting lens barrel according to claim 1, wherein the retractable lens barrel is incorporated 10 in a camera.

11. A retractable lens comprising:  
an optical system including a first optical element and a second optical element;

15 a linearly movable ring configured to be guided along an optical axis of said optical system, and further configured to retract along said optical axis when said lens changes from an operational state to a retracted state;

20 a retractable holder configured to hold said first optical element, said retractable holder retractable to a radially retracted position deviating from said optical axis;

a rear holder which includes a ring-shaped portion configured to hold said second optical element therein;

25 and

a position-controller configured to control movement of said retractable holder in association with movement of said linearly movable ring along said optical axis, such that said retractable holder is positioned on 5 said optical axis in front of said second optical element when said lens is in said operational state, and such that said first optical element is positioned at said radially retracted position radially outside said ring-shaped portion when said lens is in said retracted state,

10 wherein said ring-shaped portion of said rear holder comprises an oblique surface which is inclined with respect to said optical axis direction such that said oblique surface extends in a radially outward direction from said optical axis while extending rearward in said 15 optical axis direction,

wherein a part of said retractable holder moves obliquely rearward while proximately over said oblique surface, when said retractable holder moves to said radially retracted position from a position along said 20 optical axis.

12. The retractable lens according to claim 11, wherein said retractable holder comprises a swingable portion which is rotatably supported on a pivot substantially parallel to said optical axis, and is 25 swingable about said pivot.

13. The retractable lens according to claim 11,  
wherein said ring-shaped portion of said rear holder is  
a substantially rectangular ring shape and includes a  
front end surface and four side surfaces which extend  
5 rearward from said front end surface to surround said  
optical axis, and

wherein said oblique surface of said ring-shaped  
portion is formed on an area on said ring-shaped portion  
which extends over said front end surface and at least  
10 one of said four side surfaces.

14. The retractable lens according to claim 11,  
further comprising:

at least one guide shaft positioned outside said  
linearly movable ring and extends substantially parallel  
15 to said optical axis; and

at least one radial arm portion which projects  
radially outwards from said ring-shaped portion of said  
rear holder to be guided substantially in said optical  
axis direction,

20 wherein said rear holder is movable in said optical  
axis direction independently of said retractable holder.

15. The retractable lens according to claim 14,  
wherein said radial arm portion comprises a pair of radial  
arm portions which project radially outwards in  
25 substantially opposite directions away from each other,

and

wherein said guide shaft comprises a pair of guide shafts which are configured to be guided in said optical axis direction by said pair of radial arm portions,  
5 respectively.

16. The retractable lens according to claim 14,  
further comprising:

a stopper positioned behind said rear holder, said stopper configured to set a rear movement limit of said  
10 rear holder; and

a controller configured to control movement of said rear holder such that said rear holder retracts to said rear movement limit thereof before commencement of movement of at least said retractable holder in a  
15 direction to move said first optical element to said radially retracted position when said photographing lens moves from said operational state to said retracted state.

17. The retractable lens according to claim 11,  
wherein said first optical element comprises a lens group,  
20 wherein said retractable holder comprises a cylindrical lens holder portion which holds said lens group, and

wherein said oblique surface is a concave surface which substantially corresponds to the shape of an outer  
25 surface of said cylindrical lens holder portion.

18. A retractable lens comprising:

an optical system including a first optical element and a second optical element;

5 a linearly movable ring configured to be guided along an optical axis of said optical system, and said linearly movable ring retracting along said optical axis when said lens moves from an operational state to a retracted state;

10 a swingable member configured to be pivoted on a pivot substantially parallel to said optical axis, and to be swingable about said pivot, said swingable member positioned inside and supported by said linearly movable ring, said swingable member configured to hold said first optical element at a position deviating from said optical

15 axis;

a rear holder including a ring-shaped portion holding said second optical element therein; and

20 a position-controller configured to control rotation of said swingable member about said pivot in association with movement of said linearly movable ring along said optical axis such that said front optical element is positioned on said optical axis in front of said rear optical element when said lens is in said operational state, and such that said front optical

25 element is positioned at a radially retracted position

radially outside said ring-shaped portion when said lens  
is in said retracted state,

wherein said ring-shaped portion of said rear holder  
includes an oblique surface inclined with respect to said  
5 optical axis direction such that said oblique surface  
extends in a radially outward direction from said optical  
axis while extending rearward in said optical axis  
direction,

wherein a part of said swingable member moves  
10 obliquely rearward while proximately passing over said  
oblique surface, when said swingable member rotates about  
said pivot to move said first optical element to said  
radially retracted position from a position on said  
optical axis.